

Remarks

In regard to the present response, claims 1-11 are pending in the application and stand rejected. Applicants have amended Claims 1, 3-5, 7, and 9, canceled Claim 2, and added new Claims 12-14. According, Applicants respectfully submit that all claims are currently in condition for allowance.

Claim Rejection - 35 U.S.C. § 112

The Examiner rejected Claim 2 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctively claim the subject matter which applicant regards as invention. The Examiner stated “it appears that in one instance Applicants are using a photomask and at the same time are not using a photomask.” (Office Action, dated June 6, 2008, p. 2). Because Applicants have canceled Claim 2, the Examiner’s rejection is moot.

Claim Rejection - 35 U.S.C. § 103(a)

The Examiner rejected Claims 1-11 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,930,258 B1 to Kawasaki et al (“Kawasaki”).

The Applicants respectfully submit that Kawasaki teaches away from the use of photolithography to form the resin filling the through hole. Applicants claim a method of creating the resin filled through holes using a two step photo resist process not described by Kawasaki. The application describes depositing a layer of photosensitive resin (7) in the through hole and on the base substrate. (for example, Application Specification, ¶ 0052; Figure 10). Then the unwanted resin, located outside the through hole, is removed through a two-step photolithography process. (for example, Application Specification, ¶ 0053). The first of the two steps exposes the entire surface of the resin to an initial intensity of light sufficient to expose the upper portion of the resin

without exposing the resin located within the through hole. (for example, Application Specification, ¶ 0053; Figure 11). No photomask is used in the first step. The second step uses a photomask (23), blocking light from the resin in the through hole, and completely exposes the excess resin not contained in the through hole using light of much greater intensity than the initial exposure. (for example, Application Specification, ¶ 0053; Figure 12). The exposed resin is then removed through development and the remaining resin, located in the through hole, is heat cured. (for example, Application Specification, ¶ 0054; Figure 13). In this regard, Applicants' method avoids using the abrading process of Kawasaki to remove the excess resin. (Application Specification, ¶ 0022, “[T]he abrading process can be omitted.”).

Conversely, Kawasaki teaches the resin must be screen printed into the through holes and abrasion must be used to remove any excess resin. (Kawasaki Col. 11:13-21). This prevents the formation of a circuit pattern near the through hole opening because the pattern would be damaged by subsequent abrasion. (Application Specification, ¶ 0011, “Upon abrasion, it is difficult to abrade only the resin over the surface of the annular portion 51, and therefore, the circuit pattern 90 formed in the vicinity of an opening of the through hole conductor 51 is also abraded by the belt sander resulting in damage to the circuit pattern 90. Consequently, when the filling of resin is implemented by the screen printing method, the circuit pattern formation by the additive method can not be carried out.”).

Accordingly, Applicants' method is not suggested or taught by Kawasaki. Indeed, Kawasaki specifically states that “[i]t is noted that the protruding resin filler can be removed and flattened *only by buffing*”. (Kawasaki, Col. 11:21-22 (emphasis added)). Therefore, it is not obvious from Kawasaki that a two stage photolithographic process could be used for creating the resin filled through hole when only the use of abrasion is described in Kawasaki.

The Examiner indicated that Claim 3, directed to the method of creating the conductive layers in the through holes, is within the ordinary skill in the art and points to Kawasaki Figures 5 and 6. While photolithography is being used in the steps shown in Figures 5 and 6, as described in Claim 3; in Kawasaki it is being used in the more conventional method of creating via holes (66) and not to form a conductive layer inside a through hole. Figure 5 shows a photomask being used to create via holes (66) in a layer of solder resist (70), in order to hold solder bumps (76). Using photolithography to create via holes in solder resist is inapposite to the method of using photolithography to create a conductive layer in a through hole. Since the method taught by Applicants' invention is not disclosed or suggested by Kawasaki, Applicants submit that the method described in claim 3 is not obvious.

Claims 3-11 depend from claim 1 as amended. Accordingly, Applicants respectfully submit that the Examiner's rejection of the claims under 35 U.S.C. § 103(a) has been overcome.

Prior Art Made of Record

The prior art made of record by the Examiner and not relied upon, i.e. Toyoshima et al. (U.S. Patent No. 2001/0025414A1); Matsui et al. (U.S. Patent No. 6,662,442B1); Miyazaki et al. (U.S. Patent No. 2004/0154163A1); Kawasaki et al. (U.S. Patent No. 2005/0189136A1); Kawasaki et al. (U.S. Patent No. 7,178,234B2); Tsukamoto et al. (U.S. Patent No. 2007/0175025A1), have been reviewed and Applicants respectfully submit that the references cited do not anticipate or suggest the elements of pending independent Claim 1, as amended, or claims dependant thereupon.

Conclusion

Based on the foregoing, it is respectfully submitted that all the claims active in the subject patent application are in condition for allowance and that the application may be passed to issuance.

The Examiner is urged to call the undersigned at the number listed below if, in the Examiner's opinion, such a phone conference would aid in furthering the prosecution of this application.

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